

WESTERN NATURE STUDIES

By J. H. PAUL.

SOME WONDERFUL THINGS THAT ARE DONE BY LEAVES.

To understand clearly the lectures on agriculture planned for our series of nature chapters it is necessary to state some facts already familiar to many, but wonderful to all, about the leaf of the plant and the life action of vegetation in general.

If the leaves of any plant are first boiled in water and then soaked in alcohol, the tissues will be softened and a starchy substance exposed. Then by immersing them in a solution of iodine we shall find that the leaves turn to a beautiful blue or purple color, showing the presence of starch in the leaf, mixed of course, with other substances. Take some ordinary starch and pour some of the solution of iodine over it; the same beautiful blue color results. This is the usual and unerring test for the presence of starch, since no other substance gives this color with iodine. Whence came the starch?

Where Starch is Made.

"Leaves," said Professor Hoshonson, in his second lecture, "are the laboratories of the plant for the manufacture of its food." For, strange to say, the leaves

have the power of decomposing carbon dioxide, of retaining the carbon, and of exhaling the oxygen in a nearly pure state. This process, as we have seen, is one of plant digestion and assimilation; while the breathing proper of the plant consists of taking in oxygen and of giving out carbon dioxide—a process that goes on at all times but is more noticeable at night, when the former process (assimilation) is suspended. Since, however, the amount of oxygen produced by plants is so much greater than the amount of carbon dioxide, the general effect of plant action is to fit the air for the support of animal life, by ridding it of the poisonous carbon dioxide, and by supplying it with the life giving oxygen.

Nature's Harmonics.

Only during the germination of seeds and the bursting of buds is more oxygen absorbed than is given off by the plant, and only then is more carbonic acid evolved than is taken in and destroyed. The consumption of oxygen dioxide and also the production of carbon dioxide are greatly assisted by the absence of light, for the illuminating rays prevent the germination of seeds, and delay the bursting of buds, while the chemical rays hasten these processes. On the other hand, the heat rays hasten the development of the reproductive organs of plants. And here we see a nice adaptation; for in the spring, when the process of germination is going on, there is a large excess of the chemical rays. As summer advances and the

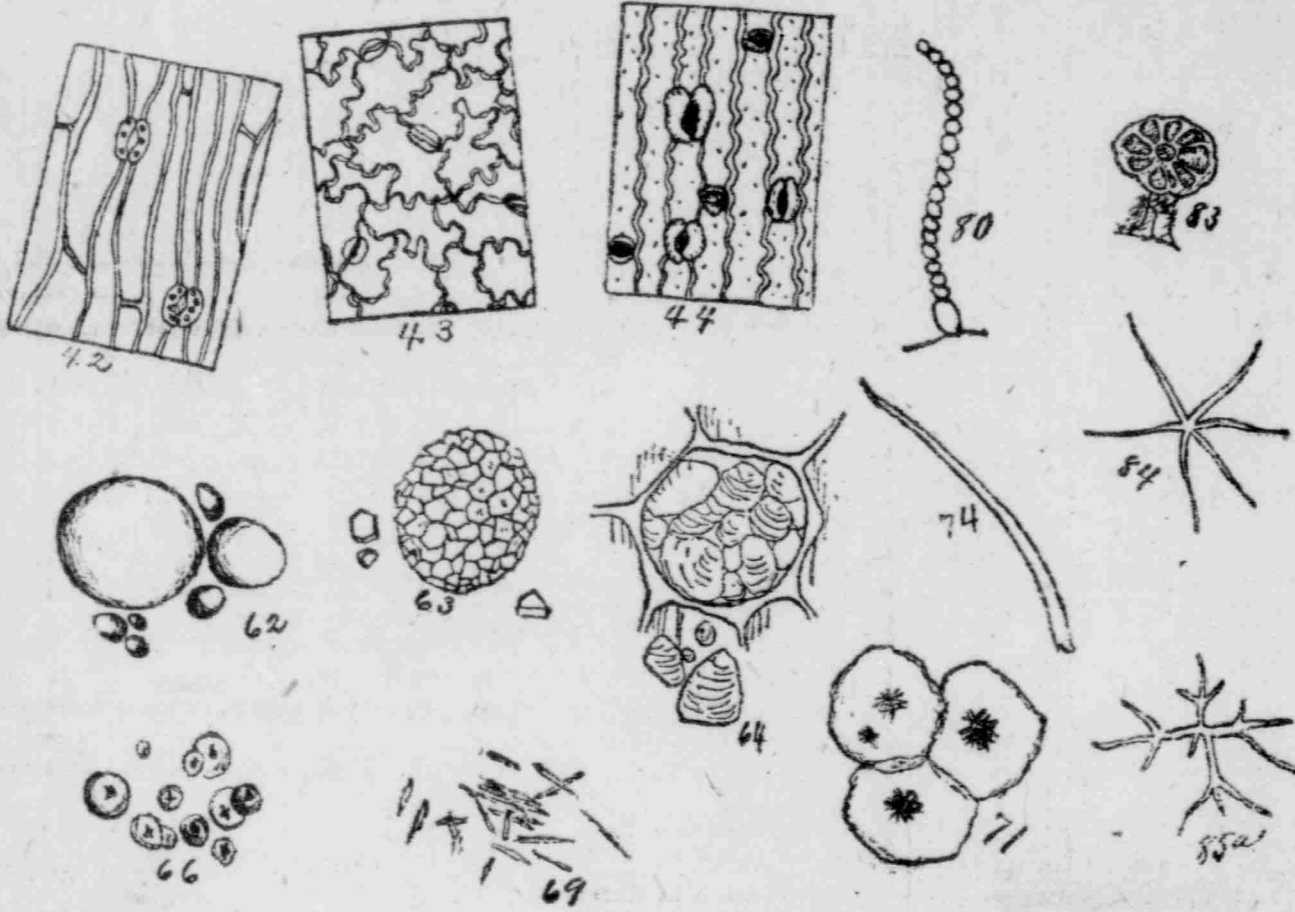
plants then unite with other elements to form the nitrogenous compounds in seeds and plant skeleton—the starch, the sugar and the various gums, oils, acids and aromatic substances manufactured by the leaves.

Just how this is done is not known. But we can observe some of the conditions essential to the process.

The Green Color.

Look at the leaves. The upper side is much greener than the under side. The substance which makes a leaf green is called chlorophyll. This is not the skin of the leaf, which is colorless and transparent, but a layer of green cells beneath the outer single layer of colorless cells. It is in the green cells that the plant food is manufactured, chiefly into starch. The cells that contain this leaf-green are the only ones that can do this work. By them the carbon dioxide is separated into carbon and oxygen. The carbon is retained for plant substance. The oxygen is breathed out into the air.

But in order that this work take place, there must be iron in the leaves,



The leaf surface and some of the leaf products as seen under the microscope.

42—Stomata, or breathing pores, of the hyacinth leaf—openings through the cuticle (skin) of the leaf for the admission of air. 43—Breathing pores on the under side of the water-cress leaf. 44—Breathing pores on surface (cuticle) of wheat straw. 45—Grains of starch from wheat kernel. 46—Starch from oats. 47—Potato starch. 48—Indian corn starch. 49—Needle crystals composed of mineral matter, found in the juice of the garden rhubarb. 50—A simple plant hair from a common grass. 51—Beaded hair of saw timber. 52—Star-shaped hair from hollyhock. 53—Stellate hair from seventh grade pupils of the training school.

and some sunlight must be present. Thus the leaves cannot make food unless assisted by the roots.

The Plant's Lungs.

The upper layers of cells, at the top of the leaf surface, are very regular and are green from the presence of this chlorophyll, while the rest of the leaf is composed of irregular cells, many of which are green, but many are not. These are the cells of the under layers and have spaces between them. These spaces lead to openings called stomata, or breathing pores, which are so small and so numerous that 20,000 of them have been counted on one inch of leaf surface.

Leaves are, however, the lungs as well as the stomach of the plant. Plants need oxygen for breathing just as animals do; since the former breathe as well as feed by their leaves. Air, indeed, is necessary for all parts of the plant, the flowers, seeds, stems and roots, as well as the leaves. If the latter are covered with dust or smoke particles, the plants will suffocate, as animals do for want of air. Chinese gardeners near Melbourne wash the leaves of their plants several times each day to keep them in health.

The Plant Dependent.

How delicate and dependent, after all, is that interesting organism which we call the plant! It seems to be so tough and so prolific of life that it covers the earth with a carpet of vegetation in spite of neglect, ill usage, persecution and climatic assaults; but in reality it is only nature's makeshift, the weeds, that do so. The plants which we prize as useful and profitable are produced with great artificial or natural labor, and are dependent upon the soil water, which they absorb, upon certain soluble salts which this water contains, upon the oxygen and carbon dioxide, which they take from the air and water, and upon sunlight, heat and good air. Deprive the plant of any of these, and it cannot live. So delicate, indeed, is the organism of the living plant that small and imperceptible amounts of coal gas in the air near broken gas mains will prove fatal to it; noxious gases of any kind seriously affect it, even when their amount may be so small as to escape chemical tests for them; while the relatively small proportion of really noxious gases in air slightly contaminated by smelter fumes, may completely poison the plant, without being sufficient in quantity to affect perceptibly the people who breathe the air. Witness the experience of Butte, formerly with few living plants, grass or trees, near, and of the damage to vegetation by our own smelter districts. The marvel is how lives so tender or things so fragile should be continued on the earth's surface with the amazing regularity and constancy which we actually behold.

Plant Life and Solar Beam.

Plants show no signs of life except when under the heating rays of the sunbeam, and the amount of the heat imparted pretty fairly measures the luxuriance of the plant's growth. The illuminating rays are of like importance with those that carry heat. In the dark, plant growth is checked, the leaves are deprived of green color, and the bulbs and fruits are tasteless and watery. Plants seek the light and will climb out of the cellar windows; while if confined in total darkness, they speedily die. The solar light-beam causes the stomata, or breathing pores, to operate; but in darkness they close, and the plant suffocates. The chemical rays of the sunbeam, however, are of no less value to the plant than their action, the green parts of leaves

growth of additional vegetation is required, the quantity of illuminating and heating rays increases relatively much faster than do the chemical rays, and the decomposition of carbon dioxide for the building of plant tissue goes on at an increased pace. But in the autumn, as plants approach maturity, and seeds are to be formed and fruit ripened, the illuminating and chemical rays are further increased. This extraordinary and curious instance of design in nature has taught the horticulturist to cover seeds with blue glass when he wishes to force their development, for by cutting off the light and heat and transmitting only the chemical rays, he can hasten germination. Later, he uses yellow glass to hasten growth by a relative increase of the luminous rays; and still later by using red glass he hastens seed and fruit formation by admitting mainly the heat rays, while reducing the other kinds.

We have said that the plant must breathe; that, like the animal, it must breathe oxygen, and that it does so chiefly by means of the leaves, which are its lungs. But oxygen is constantly absorbed by the delicate parts of plant foliage, and even by the roots and the seeds, but especially by the stomata of the leaves. Stomata, or breathing pores, the small openings in the epidermis of leaves and soft stems, allow the passage of air and other gases, have two guard cells, which open or close the gate to the stomata as the conditions of the atmosphere may require. The pores are usually most numerous on the under side of the leaves. Their number to the square inch varies from 200 on the leaf of a mistletoe to 100,000 on the leaf of a lilac, so that they are very small. As the air enters, the oxygen passes into the leaf cells, and unites with carbon there, forming carbon dioxide, which is then exhaled in a manner resembling the respiration of animals. A growing plant may absorb an amount of oxygen equal to its bulk in 24 hours.

Assimilation.

But we have also learned that carbon dioxide is likewise "breathed" in by the leaves. The leaf is green, and the green coloring matter (chlorophyll) present and the sun is shining, the carbon of this gas unites with watery substances in the leaf and forms starch, while the oxygen is thrown off. This process, by means of which the plant is chiefly built up, since plants consist mainly of carbon, is the chief form of plant digestion and assimilation. During the day, when this process is more or less active, much oxygen may be given off; during the night, when this process ceases, the effect of respiration is to give off small quantities of carbon dioxide. The starch formed in the leaves during the daytime is changed into sugar and is carried at night into the roots, tubers, or stems, or stored in thickened leaves, for future growth.

Transpiration.

A third process carried on by the leaves is transpiration, the means by which the plant gets rid of its surplus water. The plant absorbs water in great quantities from the soil, and in order to secure the proper amount of dissolved food substance. This water evaporates from the surfaces of leaves and green stems. Thousands of minute pores add this process also; and these stomata open in moist and close in dry weather, to regulate the amount of transpiration.

Adrian B. Pembroke, Stock Broker, 44 West 2d South, Phone 755.

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State Society

Continued from Page 3.

TINTIC.

Mrs. P. J. Comer of Robinson was a Eureka visitor last Wednesday.

P. J. Fennell spent Wednesday and Thursday in the capital.

George McKay and daughter have gone to Salt Lake City, where they will reside. Mr. and Mrs. McKay were visitors in the capital during the week.

Fred Larson returned last Tuesday from a visit in Salt Lake City.

A. N. Wallace last Saturday entertained William McFarlane of St. John, Utah.

R. Vance spent last week-end with his family in Payson.

Jackson McChrystal returned last Tuesday from a visit with his family in Salt Lake City.

L. C. Doty spent Monday in the capital attending to business affairs.

H. W. Horne of Salt Lake was in Tintic the early part of the week.

S. B. Marshall and Cecil Fitch returned last Monday from a few days' sojourn in the capital.

W. A. Adams and Henry Blumenthal of Provo were in Tintic last Saturday and Sunday.

James Gately visited the capital for a few days during the early part of the week.

Gus Wickman of Santaquin was a Tintic visitor during the week.

Miss Nabel Hupner was in the capital during the week, the guest of friends.

Rev. S. Allison, pastor of the local M. E. church, was in Alberta last Wednesday.

Miss Pearl Stewardson returned to the capital after a few days' visit with her parents in Eureka.

Mrs. C. C. Norwood and her daughter and son were in the capital for a few days, where they will remain for a few days.

Rev. Father Kiley of Salt Lake was in Eureka and Sunday, and conducted services at St. Patrick's church.

Mrs. Knowlton of Salt Lake City, who has been visiting her daughter, Mrs. E. G. Hanson of Eureka, returned home last Monday.

Mr. and Mrs. G. M. Gregory, after a brief sojourn with relatives in Eureka, returned to their home in Bingham last Monday.

Miss Joseph Treloar of Robinson and her son are visiting relatives in the capital.

Miss Chloe Hulsh of Payson was up from that city visiting relatives during the week.

County Commissioner George Jones of Mammoth is at present visiting in the capital, attending to business affairs.

Mr. and Mrs. Bert Lee are entertaining Miss Nellie Murphy of Park City.

Ralph Kellogg spent the early part of the week in the capital and in Provo.

Miss Amy and Henry Schaeffling gave a very enjoyable house party last Tuesday evening at the Pinn hall in Eureka to a number of their friends, and a very enjoyable time is reported.

Joseph Mellich of Eureka was a Salt Lake visitor during the week.

Mrs. C. F. Brown of Silver City, wife of Superintendent Brown of the Tintic smelter, is suffering from an attack of rheumatism, and it will be necessary to remove her to Salt Lake City for an operation.

Miss Genevieve Sullivan, Miss Foster and Miss Annie Bonner and Miss Farrell, teachers at the Eureka public schools, treated their pupils during the week to a sleigh ride, which the little ones greatly enjoyed.

Jesse Earl, Tintic manager of the Utah County Power company, was in Payson from Sunday to Thursday visiting friends.

Mrs. R. S. Robertson of Salt Lake, who has been visiting in the capital, returned to her home the early part of the week.

A pleasant surprise party was given Mrs. W. B. Mitchell last Saturday evening at her residence by a number of her friends, the occasion being her birthday. The evening was greatly enjoyed by all present, and Mrs. Mitchell was the recipient of many beautiful presents.

Eureka news: Eureka news and Miss Minnie Peterson of Santaquin were united in the holy bonds of matrimony last Friday evening at the residence of Mr. and Mrs. Hyrum Gardner, in the presence of a large number of friends and relatives. The ceremony was performed by Pastor Thorpe, bishop of the local M. E. church. A very brilliant wedding reception was held after the ceremony, and the following day the young couple were to Santaquin for a short honeymoon.

T. L. Downey of Big Rapids, Mich., is visiting in the capital, and is at the Mammoth Hotel at their residence in Model terrace, Eureka.

EPRHAIM.

The local lodge of the Woodmen of the World gave its annual ball at the Pavilion Friday night. More than 200 persons were present and a very pleasant evening was had. Lunch was served at the ball, and the tables were set with a very pleasant affair. The hall was most artistically arranged with pictures, pines, etc. Red and white were the colors used.

Shortly after 10 o'clock last night about forty people stepped in and took possession of the home of Mr. and Mrs. F. A. Beal. The party was arranged in honor of the birthday of Mrs. Beal, and was a very pleasant affair. The party was gotten up by the tabernacle choir, of which Mrs. Beal is a member. A dainty lunch was served and an interesting musical program was carried out by the choir.

A Valentine party was given by Mrs. Catherine Thompson at her home on Monday night to celebrate her anniversary. Dinner was served, the tables being artistically decorated in smilax and carnations, while the decorations were of hearts made of various colors. The evening was spent in games, etc.

Mrs. Clara Jacobson gave a surprise Wednesday afternoon at her home. Thirty ladies were present, who gave her a beautiful present. Lunch was served shortly after the arrival of the ladies and a pleasant afternoon was had.

On Tuesday night Mr. and Mrs. Fred Nielson delightfully entertained at a dinner party. Thirty guests were present and an enjoyable evening was spent in games, cards, etc. Refreshments were passed during the latter part of the evening.

Mrs. Otto G. Olson was the recipient of a surprise Monday night in honor of her fiftieth anniversary. A large crowd was present. Mrs. Olson was presented with a beautiful set of silverware. Lunch was served during the evening.

The little son of Mr. and Mrs. Andrew Mortensen is suffering from pneumonia.

Dr. Afe Nielson of Idaho has been visiting his brother in this city, Dr. A. J. Nielson.

Miss Marion Doyus returned today from Thistle, where she has been visiting for the past two weeks.

Mr. and Mrs. Clarence Peterson are rejoicing over the arrival of a son.

Mrs. Josephine Jorgensen, who has been visiting relatives and friends at Thistle during the past week, returned to her home in this city today.

Miss Gertrude Peterson is home from a five weeks' trip to Tucker and Provo. Clara Doyus is home from Salt Lake, where she has been spending a few days visiting friends.

Kesler Peterson is spending a few days at the state capital this week.

BRIGHAM.

A large crowd turned out to the married people's ball at the opera house Friday evening. Thirty guests were present and a very pleasant evening was had. Lunch was served at the ball, and the tables were set with a very pleasant affair. The hall was most artistically arranged with pictures, pines, etc. Red and white were the colors used.

Only \$100.00 good for nine months. Have you made the tour? It's a winter trip worth considering. Itineraries and sleeping cars. Ask Kenneth Kerr, D. P. A., Salt Lake Route.

AN EXQUISITE ARRAY OF CHARMING SPRING HATS

\$5.00

For three weeks past we have been receiving a sample lot of "pattern" hats—a collection of the most charming spring hats

we've ever seen. They are the latest adaption from Parisian and New York models and creations by clever designers of millinery modes. These hats range in price as high as \$10, but to introduce the new styles we will place every hat on special sale Tuesday, Wednesday, Thursday and as long as they last at \$5.00.

Every new design and whim in millinery will be represented. The great variety insures a happy choice to every purchaser. Our doors open on this rare offering at 8:30 o'clock Tuesday morning.

Salt Lake's Style Promoters

BANKS' MILLINERY

116 MAIN ST.

\$5.00



ers from all parts of the state and members of the general board of Salt Lake City were present. The affair was a most pleasant one and wound up with a grand ball.

A general house warming was given in the Fourth ward meeting house Friday afternoon, the ward having just completed its meeting house. Some 50 people from the ward, besides many invited guests, were present. Four long rows of tables were arranged the full length of the main room and all sat down to a sumptuous feast. The affair was a great social success.

Harry J. Brysdale and Miss Ellen M. Berglund, both of Weber county, were married Friday evening in this city by Secretary J. Edward Taylor of the horticultural board of Salt Lake was in Brigham on business Wednesday.

George Amos and John Daniels spent the first part of the week in Salt Lake, attending to mining and other business.

The dance at the Payson Pavilion by Clark's orchestra on Friday night was enjoyed by an average crowd.

S. C. Stoll is down from Salt Lake for a day or two.

Wallie Brough of Nephi has been in Payson several days on business.

The H. A. B's were entertained on Thursday evening by Miss Laura and Stella Lyle.

Raymond Kerr of this city and Dora Openshaw of Santaquin were married by Bishop J. A. Lovell last Monday.

Mrs. David Barnett has been in Payson for a few days visiting with her sister, Mrs. H. H. Stinson.

The public schools are preparing an opera entitled Phyllis, the Farmer's Daughter, to be given at the opera house at the end of the school year.

Mrs. Mary McBeth entertained the Young Men's Association of this city on Wednesday evening. Prizes were awarded to Jack Dixon and Mrs. Calloway.

The Y. M. C. A. institute held at the cars in the D. & R. G. yards last Tuesday was attended by a great number of Payson people. The professors in charge gave out much valuable information on different subjects.

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Kesler Peterson is spending a few days at the state capital this week.

Beaver, spent several days this week visiting friends here.

Mrs. William Hadfield gave a most pleasant birthday party at her home Wednesday evening.

Miss Sadie Broadbent entertained about thirty of her young lady and gentlemen friends Saturday evening at the home of her parents, Mr. and Mrs. J. S. Broadbent. Games and music were the program. Saturday the relief societies of Lehi gave a party in the opera house in honor of Mrs. Rebecca Standing, president of the relief societies of the Alpine state, in honor of the estimable lady's 51st birthday. The festivities commenced at 3 p. m., and closed with a dance at night.

Mrs. Rachel Anderson gave a dinner Saturday to the high school basketball team. Friday evening Mr. and Mrs. William Crabbe entertained in honor of Peter Christensen and Mrs. M. J. Madsen.

Wednesday Mrs. Parley Austin was the guest of honor at a party given by the members of the Fourth ward relief society. Friends of Mr. and Mrs. Sorren Sorrenson gave them a happy surprise party at their home Wednesday evening.

Mr. and Mrs. Charles C. Crabbe entertained at progressive dinner Thursday evening.

Joseph Davis, Jr. and Miss Ruth Dickerson were married this week. The bride comes from American Fork and the groom is a resident of Lehi Junction.

The local Christian Endeavor society were entertained Monday evening by Mrs. T. J. Wadsworth.

Friday Mrs. C. C. Crabbe and Mrs. A. W. Kirkham were visitors at Provo, the guests of Mrs. M. H. Anderson.

TOM JEFFERSON LOVES GOLF

Well Known Actor Is An Ardent Enthusiast of Ancient Game.

Thomas Jefferson, who is again playing Rip Van Winkle this season, is an enthusiastic and ardent lover of golf. Having played the game now for about six years, he has become very proficient at swatting the little white ball, but when he does make a bad stroke he—well, when he does make a bad stroke he under the circumstances?

It is well known that Mr. Jefferson spends his summers at Buzzard's Bay, or rather at Crow's Nest, for that is the name of his beautiful estate. Here he has a great deal of his leisure time on the golf links and here it is that he won (?) a beautiful silver cup by a single stroke.

During the play he had tied his opponent's score up to the last hole and then made a foolie, which, to the spectators as well as himself, seemed a certain loss of the match. Mr. Jefferson was still fully a hundred feet short of the green, looking rather discouraged after his costly mis-stroke, when, with scarcely any aim whatever, he carelessly struck the ball, which bounced lazily up on to the green, straight for the flag, and then merrily disappeared into the cup.

The crowd cheered wildly and rushed up to congratulate Mr. Jefferson, who did not stop running until he reached the hole and made sure after rubbing his eyes that he was not dreaming. This remarkable put of fully fifty yards once more tied the game, which was played off the following day. This time Mr. Jefferson defeated his opponent, three up.

A few days later some friends presented him with a large silver cup, beautifully engraved, which he proudly exhibits to visitors as "Crow's Nest." However, he is always careful that they do not remove it from its place, for on one side of it is the inscription, "Not Won, but Stolen."

During the last 35 years I have cured thousands of sufferers, people who have tried every doctor and remedy, but found each one a complete failure. Then they heard of me—write for free advice as I am asking you to do, and were cured. Testimonials are my proofs. I will send you scores of such letters as the following:

Concord, N. H. The Honorable House of Representatives, Washington, D. C. Dear Sir: I regard Dr. Towns' cure of my brother and Congressman Doble, of Wisconsin, as a wonderful. Neither had any relief until Dr. Towns treated them. Very truly, (Signed) John J. Jenkins.

Let me send you my booklet on Epilepsy. IT'S FREE. Address Dr. W. Towns' Medical Co., Dept. 165, Fond Du Lac, Wis., U. S. A.

OVERCOME BY SMOKE.

New York, Feb. 20.—Ten persons were trapped in the basement of a burning tenement on Henry street today, and three of them were overcome by smoke before the firemen could break their way into the building. Meanwhile, the members of the thirty other families in the building, driven to the street by the flames, were terror-stricken at the sight of the persons in the basement dwelling beating against the iron-barred windows in their efforts to escape. The three persons overcome were quickly revived. The fire was confined to lower floors of the building.

SUFFRAGE HEARING.

Albany, N. Y., Feb. 20.—Women from various sections of the state are expected to be present at the joint hearing on Wednesday before the judiciary committee of the senate and assembly on the bill proposing an amendment to the constitution to permit women to vote. Rev. Anna H. Shaw will make an address.

SEIZED FOR DEBT.

Winnipeg, Feb. 20.—Sheriff Inkster seized the mayor's chair at the city hall today to satisfy a judgment obtained by O'Kelly Brothers, contractors, for one of the city bridges.

Salt Lake Charity Association.

The purpose of this organization is to investigate all applications for charity; to help the helpless; to give opportunity to the worthy but unfortunate to help themselves; to protect the public from imposition. In short, to make charity practical and systematic.

Funds are urgently needed, and those contributing may be assured that their money will be judiciously expended where it will do the greatest good.

Contributions should be sent to M. H. Walker, treasurer, at Walker Brothers' bank.

Officers of the association are: Dr. T. B. Beatty, president; J. B. Evans, secretary; M. H. Walker, treasurer.

Other directors: Simon Bamberger, W. Mont Ferry, W. V. Rice, F. A. Druell, Rev. E. I. Goshen, William H. Thibault.

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During the last 35 years I have cured thousands of sufferers, people who have tried every doctor and remedy, but found each one a complete failure. Then they heard of me—write for free advice as I am asking you to do, and were cured. Testimonials are my proofs. I will send you scores of such letters as the following:

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Catarrh Medicine FREE

I will send one month's medicine free to every reader in connection with my new vaporizer.

I want every sufferer from Catarrh to accept this offer. I mean what I say. I send one month's medicine free in connection with my vaporizer, simply to demonstrate that Catarrh can be cured. To prove that I have the best treatment that can be produced; the safest, surest, quickest cure in the world for Catarrh in any form.

Take advantage of this opportunity. Don't go through life suffering from this treacherous and obnoxious disease. Stop wasting your money for patent medicines, they cannot cure. A thorough, systematic treatment like mine is what you need. The cure that follows is complete and permanent.

These Are The Medicines. From beneath is an exact illustration of the medicines that I send free—in connection with my vaporizer. They are for internal use to clean out the entire system. For external use also to clean out the Catarrh germs and poison from the head, nose and throat. Don't put this off, wait today and seek out suffering friends about it so they can take advantage of it and remember that accepting my offer places you under no obligation to me whatever. Dr. T. F. Williams, Dept. 960, Des Moines, Ia.

WRITE TODAY

Take advantage of this opportunity. Don't go through life suffering from this treacherous and obnoxious disease. Stop wasting your money for patent medicines, they cannot cure